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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
Federal-State Joint Board on)	CC Docket No. <u>96-45</u>
Universal Service)	
)	
Forward-Looking Mechanism for)	CC Docket No. 97-160
High Support for Non-Rural LECs)	

**COMMENTS OF AMERITECH TO
FURTHER NOTICE OF PROPOSED RULEMAKING**

A. Introduction and Summary.

Ameritech files its comments responding to the Commission's questions on mechanisms for the calculation of non-rural carriers' forward-looking economic costs of providing services that are supported by the Universal Service mechanism in states that elect not to submit cost studies. In these comments, Ameritech will respond to questions concerning the design of the switching, interoffice, signaling and local tandem components of the platform.

In its comments filed on February 18, 1997 in the Commission's Cost Proxy Models Proceeding¹ Ameritech, along with many other parties, expressed grave concerns about the ability of the proposed cost models to accurately calculate forward-looking costs of even the most efficient real world carriers. In a nut shell,

¹ In the matter of The Use of Computer Models for Estimating Forward-Looking Economic Costs, DA 97-56 (Cost Proxy Models Proceeding).

the models cannot provide any relevant input into pricing decisions of carriers, since they do not even seek to project expected actual costs, but only estimate the forward-looking costs of an optimally configured hypothetical firm, which are, by definition, lower than those incurred by any possible actual market participant.

Even though it is responding to the Commission's questions, Ameritech still has the same concerns about the use of the models, but rather than re-argue them here is attaching a copy of its comments in the Cost Proxy Model Proceeding as Exhibit A.

B. Answers to the Commission's Questions.

1. Mix of Host, Stand-Alone, and Remote Switches.

The Commission has tentatively concluded that it should use a hybrid model that "should include an algorithm that will place host switches in certain wire centers and remote switches in other wire centers" and that "the host-remote arrangement is more cost-effective in many cases than employing stand-alone switches."² However, no such algorithm exists, nor can one be developed, that can accurately determine where Ameritech, or any other efficient carrier, places a stand-alone switch versus a remote/host configuration. Ameritech has never used an algorithm to mechanically decide whether to use a stand-alone

² ¶122.

switch or a host-remote arrangement, nor is one appropriate. While a key criterion of the switch deployment process is cost and economic efficiency, the process that Ameritech has utilized over the years also reflects many other equally as important considerations. These other considerations are not of the type that can be reduced to an algorithm.

Ameritech evaluates office placements through a case-by-case basis process.

This process consists of four steps:

1. Ameritech performs an in-depth analysis to determine the requirements for the switch;
2. Ameritech issues a Request for Proposal (RFP) to the vendors;
3. the vendors respond with their design along with installation intervals and prices; and
4. using the RFP responses, Ameritech chooses the bid that best meets cost effective objectives while matching the office requirements and Ameritech's ability to operate and maintain the design.

The availability of switches to serve as hosts, the number of lines to be supported, types of services demanded by customers, the grade of service to be supported, geographical calling patterns in the area and vendor discounts are some of the other characteristics that may impact an individual choice between a stand-alone switch or a host-remote arrangement. Each of these characteristics are highly relevant to an optimal network configuration and must, therefore, be reflected in any model projecting the costs of an optimally efficient network.

Ameritech has undertaken an analysis to illustrate the investment differences between a stand-alone switch and a host-remote arrangement for the three vendors (Lucent, Nortel and Siemens) from which Ameritech purchases its switches. The analysis begins by examining similarly-sized, existing remote switches, one from each vendor. Using Bellcore's Switching Cost Information System (SCIS), the forward-looking investment for each remote switch based on list prices was determined. Next, each remote switch was redesigned as a stand-alone switch by adapting the inputs into SCIS to correspond to a stand-alone arrangement. Table 1 shows these investments and the resulting differences. For each vendor, the investment for the remote switch in a host-remote arrangement is less than the investment for the corresponding stand-alone switch.

Table 1
Investment at List Prices

	Standalone Switch	Host-Remote Arrangement	Difference
Lucent (6,894 lines, 3.08 line CCS)	\$2,634,200	\$2,253,052	\$381,148
Nortel (5,733 lines, 2.83 line CCS)	\$4,008,241	\$2,307,778	\$1,700,463
Siemens (2,258 lines, 3.00 line CCS)	\$1,270,453	\$462,795	\$807,658

Note: The Host-Remote Arrangement Investment includes remote switch investment and incremental host switch investment.

As an alternative, at least for its exchanges, Ameritech believes that its existing digital network design is the most accurate estimate of an optimal network configuration, and should be used as the basis for defining the mix of

stand-alone and host-remote switch arrangements. It also should be used as input into any forward-looking cost model.

2. Capacity Constraints.

The Commission tentatively concludes that “the selected mechanism should assign more than one switch to a wire center whenever the mechanism predicts that any one of a set of capacity constraints would be exceeded.”⁴ This assumption should not be adopted, because it is unduly simplistic and is not consistent with practices that are either followed today or would be followed in an optimally efficient network.

While it is true that specific switch architectures have capacity constraints, other factors (such as the need to support a rich diversity of services or to permit operating flexibility) are also relevant to a decision to place multiple switches. Consequently, an assumption that the assignment of multiple switches is based solely on only switch capacity constraints oversimplifies real world operations, and would result in forward-looking costs that are artificially below those of Ameritech or any other efficient carrier. For that reason, this approach should be rejected. Moreover, any network designed solely on such a basis would be far from optimal. Thus, at least for wire centers in Ameritech’s service areas, the number of switches that currently exist is the best and most efficient forward-looking estimate of switches in a wire center.

⁴ ¶124.

3. Switch Costs.

The Commission tentatively concludes that “the selected mechanism should incorporate the Commission Staff’s estimates of switching costs because these estimates are based on filings with the Commission that record actual ILEC switch purchases.”⁵ Ameritech has not yet had the opportunity to fully examine the Commission Staff’s statistical analysis discussed in Notice, so it is not able to make detailed comments on it at this time.⁶ However, as a general comment, Ameritech is concerned that any cost analysis that does not recognize the usage characteristic of a switch, but rather focuses solely on lines or ports, cannot accurately or reliably predict real world forward-looking economic costs of switching. Nor does Ameritech support Sprint’s suggestion of using information from a dated version of the BCPM model. An engineering model such as Bellcore’s Switching Cost Information System (SCIS) can accurately and reliably measure port and usage investments in digital switches, and should be the mechanism for calculating switch investment.

⁵ ¶132.

⁶ ¶130. The Common Carrier Bureau released the data underlying the Staff’s estimates on August 4, 1997, (DA97-1663).

4. Percent of Switch Assigned to Port and to Provision of Universal Service.

The Commission tentatively concludes that “switch costs should be divided between line-side port and usage costs.”⁷ Ameritech agrees. However, the cost of this usage cannot be calculated until the definition of the local usage to be supported is resolved by the Commission.

Further, the Commission tentatively concludes “not to adopt either of the models’ assumptions regarding the percentage of the switch investment that is associated with the port.”⁸ Instead, the Commission seeks further comment on how it might determine “the percentage of the switch investment is associated with the port” using information filed in response to the FCC *Access Charge Reform Order* or some other way to determine such a percentage.⁹ If the investment for ports is developed separately from usage, as the Commission proposes in the Notice, then there is no need to allocate any additional switch investment to ports.¹⁰

Moreover, a full bottoms-up engineering approach is the most accurate method for developing port and usage investments, rather than the partial approach discussed Notice¹¹ and the duplicative tops-down approach discussed later in the

⁷ ¶135.

⁸ *id.*

⁹ *id.*

¹⁰ ¶132.

¹¹ *id.*

Notice.¹² Engineering models, such as SCIS, that use a bottoms-up approach¹³ accurately compute the forward-looking investment for ports. These investments are based on the line and usage characteristics that are unique for that wire center.

5. Interoffice Trunking, Signaling, and Local Tandem Investment.

The Commission tentatively concludes that the “selected mechanism should calculate specific cost estimates for the interoffice elements necessary to provide these functionalities.”¹⁴ Ameritech agrees that cost estimates at this level of specificity are appropriate, but does not agree with Commission’s tentative conclusion that “only Hatfield’s platform is currently adequate in this regard.”¹⁵ Unfortunately, the Hatfield model is also flawed. For example, the Hatfield model has provided the capability to recognize higher loop installation costs in different geographic areas. However, this same consideration is lacking for the interoffice elements found in Hatfield 3.1. Also, the input value of 1/3 used by the Hatfield model for sharing has no basis in a cost model that is reflecting the economies of scale of a single provider. This input should be consistent with current telephone operating experiences. In addition to these obvious examples of structural and input deficiencies, the release-to-release modifications in the Hatfield model, (i.e., moving

¹² ¶135.

¹³ See, Viktor Schmid-Bielenberg, “Bellcore’s Switching Cost Information System (SCIS) Cost Model: A Practical Approach to a Complex Problem,” *A Symposium on Marginal Cost Techniques for Telephone Services*, The National Regulatory Research Institute, Columbus, Ohio, August 12-17, 1990, for full discussion of this bottoms-up approach used by SCIS.

¹⁴ ¶141.

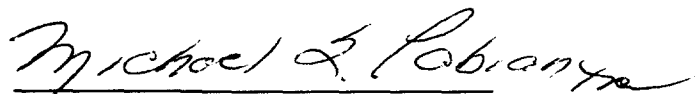
¹⁵ *id.*

from 2.2.2 to 3.0 to 3.1 to 4.0), appear to yield predetermined results no matter what additional complexities or modifications have been added. Consequently, Ameritech is concerned with the accuracy of this model that, for example, adds complexities for interoffice transport between versions 3.1 and 4.0 and result in costs that are 33% smaller.

C. Conclusion.

For the above reasons, Ameritech proposes that the Commission modify its tentative conclusion to (1) use actual host/remote deployment in lieu of an algorithm, (2) use actual deployment of multiple switches in lieu of a mechanism that only considers switch capacity, (3) calculate line side port costs and switch costs separately and reflect switch costs based on usage, and (4) not use the Hatfield model to calculate interoffice elements.

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August 8, 1997

Attachment A

Before the
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In the Matter of)	
)	DA 97-56
The Use of Computer Models For)	
Estimating Forward-Looking Economic)	
Costs)	

Comments of Ameritech

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Dated: February 18, 1997

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Costs)	

Comments of Ameritech

I. Introduction & Summary.

Ameritech files its Comments responding to the Public Notice¹ and the related Staff Analysis² regarding cost proxy models. In its Comments, Ameritech will show that, as the Commission Staff establishes in the Staff Analysis, the current proxy models are flawed, untested, and produce conflicting and unreliable results. Accordingly, the Commission should not utilize them for any purpose before they are fully validated.

Ameritech will also demonstrate that no cost proxy should be used to set prices, particularly in a marketplace that is or may become competitive. No matter how sophisticated or refined a cost proxy model becomes, it still

¹ "Commission Staff Releases Analysis of Forward-Looking Economic Cost Proxy Models," FCC, DA 97-56, January 9, 1997 ("Public Notice").

² Atkinson, Jay, Chris Barnekov, David Konuch, William Sharkey, and Brad Wimmer, "The Use of Computer Models for Estimating Forward-Looking Economic Costs," FCC Staff, January 9, 1997 ("Staff Analysis").

only seeks to estimate costs, and not to replicate the operation of competitive forces in an efficiently operating marketplace. For that reason, using cost proxy models to set prices can stifle or distort the normal development or operation of a competitive market to the detriment of consumers.

Moreover, without adjustments the cost models being examined in this case are not even useful as an input into pricing decisions, since they do not estimate the expected costs of real market participants. Rather, the models estimate the forward-looking costs of an optimally configured hypothetical firm, whose estimated costs are thereby substantially lower than the actual costs that any market participants will likely incur. As such, rates set based upon forwarding-looking costs are not appropriate for a competitive market because they provide insufficient potential economic incentives to drive competition and investment.

The Commission further should not at this time seek to develop a single model for a multiplicity of tasks. No such multipurpose model currently exists and there is no reason why the Commission should devote the limited time available before implementation of the universal service fund seeking to develop one. This is particularly true here since, given the diverse cost characteristics of the industry, it is highly unlikely that such a multipurpose proxy can be developed that will accurately estimate the costs

of all areas, carriers and services with enough precision for use in pricing. For these reasons, the Commission should initially focus only on the possible use of cost proxy models in establishing the universal service fund recommended by the Federal-State Joint Board because that application simply entails identifying high cost versus low cost areas, a task that does not require a high level of precision.

Ameritech agrees with the Commission Staff that any cost proxy model must be validated through rigorous testing of its assumptions, input data, algorithms, and its results. But, the Commission also should continue to consider other options for universal service funding, such as a competitive bidding mechanism recommended by the Joint Board, which do not depend on unreliable assumptions and input data.

II. Rates Should Not Be Set At Cost.

A. Setting Rates Based Solely on Costs Distorts Efficient Competition.

It is axiomatic, that the goal of regulatory ratemaking should be to facilitate the action of a competitive market or, in the absence of competition, to replicate the pricing results of a competitive market. Use of the cost proxy models to establish prices does not meet this objective because pricing at cost does not replicate the dynamics of a competitive market, nor does it duplicate the outcome of a competitive process. In fact,

mandatory pricing at cost can stifle competition and lead to economic inefficiency.

In a market economy, the link between prices and costs is not a simple one. While it is true that in a competitive market, in the long run, total expected revenues should move toward total costs (including the cost of capital) of the higher-cost firms in that industry, that also means that all other participants are expected to generate revenues in excess of their costs.

³ The incentive to capture industry profits is the mainspring for innovation, investment and competitive entry. Indeed, it is the profitability of the lower-cost firms that motivates less efficient firms to reduce their costs and impels potential entrants to displace the higher cost firms over time. For these reasons, forcing firms to price at or below their cost, with no prospect of economic profit, removes the incentive for innovation, investment, and entry.

Moreover, the informational demands of a pricing system based on cost studies (or cost proxy models) are too great to be successfully implemented. For, not only must prices in the aggregate reasonably be expected to generate revenues to cover costs, but each rate and rate element should be correctly determined so as not to inhibit efficient entry.

³ Firms can leapfrog one another so that different firms at different times represent the high-cost firms on whose basis overall price levels will move toward.

B. Prices Should Never Be Set At Forward-Looking Costs.

The Commission Staff proposes that the cost proxy models be exclusively based upon forward-looking costs. However, pricing at forwarding-looking costs, as implicitly defined by the cost proxy models, is particularly destructive to the development and efficient operation of a competitive market.

Based upon the methodology and assumptions of the cost models being considered in this proceeding, forwarding-looking costs will systematically be set below the expected costs of even the most efficient actual market participant.⁴ According to these models, and as applied recently in the telecommunications industry, the term “forward-looking costs” has become shorthand for a particular hypothetical scenario that assumes a “hyper-optimal firm.” That is to say, the firm is assumed to operate under a set of assumptions that do not conform to reality, but are intentionally designed to produce the highest conceivable level of productivity. Examples of unrealistic assumptions that can underlie a “hyper-optimal firm” are that it can instantaneously and ubiquitously build or re-build its network using the newest technology; it will incur no removal costs for old facilities and equipment; it can perfectly forecast demand; and

⁴ Normally, forward-looking incremental costs are used to establish a price floor to prevent cross-subsidy and stand alone costs (i.e.: the costs of a firm that only provided the service in question) are used to establish a ceiling.

it will serve the entire market.⁵ Even a casual review of reality confirms that such a hypothetical hyper-optimal firm is mythical.

Setting rates at the low levels dictated by this forward-looking cost methodology eliminates the economic incentives necessary to drive competitive and network investment, since no one will enter or invest in the market, if the best it can hope for is to break even. For that reason, use of the cost proxy model to set prices should be rejected because it is inconsistent with the pro-competitive and deregulatory policies of the Telecommunications Act of 1996. A policy of setting rates at forward-looking costs is also confiscatory.

III. The Overriding Criterion Is Accuracy.

A. The Ability to Estimate Expected Costs of Actual Market Participants Is Key.

Ameritech submits that the acid test of the validity of any cost study or proxy model is how well it estimates the actual or expected costs of production of real market participants. That is to say, the study or proxy model must accurately predict anticipated actual costs (both on an overall basis and for each carrier, service or area involved) with sufficient accuracy

⁵ In addition, such model's assumptions are utopian in that they assume a static situation where networks do not have to be designed to handle real-world events such as new housing developments, customer moves and termination of service, equipment and facility failures, etc. These unrealistic assumptions of a static market allow for the use of spare capacity and fill factors that would not be adequate for a firm to service the dynamic marketplace that actually exists. Again, the effect is to understate actual costs.

for the purpose for which it is being used. For instance, a model could predict average national costs with reasonable accuracy, but its use to establish rates for individual carriers that serve areas with higher than average costs could be confiscatory.

Because the cost models being considered in this proceeding do not even attempt to predict actual costs, they should not be used to make cost or pricing decisions for individual firms. At most, they should only be used to identify high cost areas to be targeted for universal service funding. In fact, this application was the original purpose of the BCM model.

Identification of high cost areas only requires that the Commission establish relative cost relationships between areas, which requires far less precision than determining actual costs for setting rates for individual carriers. However, it is important to note that the Hatfield Model is so flawed that it is not even useful to establish relative cost relationships between areas.⁶

If the flaws in the models are corrected, then they might also be used on an interim basis for sizing of and calculating distributions from the national universal service fund. However, if the cost proxy models are used to quantify and distribute funds, the Commission should recognize that the

⁶ For example, based on Hatfield 2.2.2 results, costs per loop for Illinois are 3.2% higher than for Wisconsin (\$16.48 vs. \$15.97). However, actual cost data filed in the 1996 NECA USF Data Submission shows that loop costs for Ameritech Illinois are 21.8% lower than for Wisconsin (\$14.79 vs. \$18.91).

models will understate expected actual costs. For this reason, the proxy model's output should be corrected and only used temporarily until more reliable data is available. The Commission also should continue to consider other longer term methods for universal service funding for high cost areas (such as competitive bidding as recommended by the Joint Board⁷) that more closely duplicate market dynamics, and do not depend on inherently unreliable assumptions and complex calculations.

B. The Commission Staff's Proposed Criteria Should be Re-focused on Validating the Models.

The Commission Staff asks the parties to address what criteria should be used to evaluate the cost proxy models. The Staff correctly recognizes that in order to determine if a proxy accurately reflects costs, the model's assumptions, inputs and algorithms must be carefully examined and tested. Ameritech agrees that this bottoms up approach to validation is critical to ascertaining the accuracy of any cost proxy.

The Commission Staff also states that the output of a cost proxy should be validated against independent cost evidence. Ameritech agrees. To this end, Ameritech proposes that such top down validation be performed in two ways. First, the output of the model should be compared

⁷ The Joint Board recommended "that the Commission, together with the state commissions, continue to explore the possibility of using competitive bidding for determining the level of federal universal service support." (para 34).

against actual cost evidence available from both public and private sources.⁸

Second, the model's input data should be varied to determine if the model produces logical changes in its output that conform with experience.

The Commission Staff asks the parties to comment on six criteria that might be used to evaluate the cost proxy models.

1. Adherence to forward-looking cost to set prices.
2. Ability to measure narrowband network costs.
3. Consistency with independent cost evidence.
4. Potential for independent evaluation of model algorithms and input assumptions.
5. Flexibility to vary user input choices.
6. Ability to use the model for multiple purposes.

Ameritech will assess each of these criteria against how well it validates a cost proxy model based upon bottom up or top down analysis.⁹

1. *Rates Should Never Be Set At Forwarding-Looking Costs.*

This "criterion" is not actually a criterion, but rather advocacy of the exclusive use of one type of cost model methodology -- forward-looking incremental costs. As previously discussed, since a model that estimate such forwarding-looking costs systematically predicts costs that are below

⁸ "Commission Staff Releases Analysis of Forward-Looking Economic Cost Proxy Models," FCC Public Notice, January 9, 1997.

⁹ Ameritech will discuss items 3 and 4 together.

the actual costs that any real market participants could conceivably actually incur, its results must be corrected upward before it is used.

2. *Measurement of the Costs of a Narrowband Network Does Not Estimate Actual Costs.*

The second proposed criterion is that the cost proxy model estimate the full stand-alone costs of a narrowband network. This criterion necessarily limits the model to only one purpose -- universal service funding. The assumption of a narrowband network does not comport with the public switched network of any carrier, which are used to provide a full range of services, not just narrowband. As such, a model that assumes a stand-alone narrowband network will produce results that have no relationship with the expected costs of providing any service (either narrowband or broadband). Moreover, if a narrowband network approach is adopted, then not only must costs applicable solely to broadband service be excluded, but by the same token the significant efficiencies and cost savings resulting from the sharing of many common facilities and functions between narrowband and broadband services must also be excluded.

If the stand-alone costs of a narrowband network are to be estimated, it must be recognized that, since the model will produce expected future costs of a network that does not exist, it cannot be tested against any empirical evidence. As such, this approach opens the door to speculation and gaming by parties that seek to justify a specific outcome.

3. *Any Cost Model Must Be Consistent With Independent Evidence.*

The third proposed criterion is that the model produce results that are consistent with independent evidence. As stated earlier, Ameritech believes that this is the acid test of any cost model or proxy. The Staff Analysis suggests several sources of independent evidence that might be used to validate a cost proxy model:

- Competitive bids for loop installations;
- Cable installation costs;
- Econometric studies;
- Actual engineering studies for a CBG;
- ARMIS data;
- Comparison of physical measures of investment between the model and reality; and
- Use input price indexes to measure the effect of changing input prices.

Subject to the limitations discussed below, Ameritech agrees that each of the above sources may provide data that is valuable in validating the results of a cost model. Ameritech also suggests two other sources that are even more valuable -- actual cost studies, and tests of the consistency of output of the model based upon varying its inputs.

First, market bids can be used to help calibrate the model as long as the model's results are not used to set prices. Otherwise, there will be

circularity between the model's results, the prices that LECs are able to charge, and the competitive prices.

Second, based upon its experience as both a cable provider and telecommunications carrier, Ameritech believes that there are significant differences between the costs of installing and operating a telecommunications network and a cable network. As such, actual evidence of telecommunications costs is more pertinent to testing telecommunications cost proxy models, than corresponding cable costs.

Third, while an econometric model or statistical method can help calibrate a cost model, such econometric models suffer from the same basic weakness as cost proxy models themselves -- both are only as good as their underlying data, assumptions, inputs and algorithms. Thus, a modeler using econometric models or statistical methods to validate a cost proxy model should provide convincing and scientific evidence that the data, assumptions techniques, and results of such econometric models are valid.

Fourth, Ameritech agrees that engineering studies can be another potential source of evidence testing the validity of a cost proxy.¹⁰ Ameritech recommends that the engineering studies be done for a wide variety of configurations and conditions with different lines per square mile, different

¹⁰ This is not to advocate the use of cost proxy models in pricing, but only to say that if one wants to create a forward-looking cost proxy model, an engineering study for a selected CBG is one way to calibrate the model.

input costs (e.g. labor rates), different local government regulations for reimbursement for trenching, and in different areas of the country. A cost proxy model that is correct on average is still worthless (and is especially misleading) if it does not adapt correctly to all relevant variations.

Fifth, Ameritech agrees that ARMIS data is another source of evidence against which to test a cost proxy. However, as the Commission Staff Analysis notes, variances between the models and ARMIS may be due to many causes, such as (1) technological change that reduces the level of necessary investment and therefore possible under-depreciation of incumbent carrier's assets; (2) incorrect specification of the cost proxy models; (3) declining input prices; and (4) LEC inefficiency. Numerous other possible explanations exist, including flaws in the cost model.

The question of why a model varies from independent evidence must be fully answered before the model is used. It is not sufficient to simply assume (as some IXCs do) that any variances between a model's results and ARMIS data must be due to "LEC inefficiency". Such a conclusion is disingenuous and unscientific. In this regard, much of the alleged inefficiency results from the unrealistic assumptions that underlie the cost proxy models themselves, and do not represent inefficiency on the part of any firm. Further, an allegation that the LECs are the sole cause of any inefficiency ignores the role that regulators traditionally have played in

overseeing LEC performance. Indeed, incentive regulation has created significant incentives for efficiency. Moreover, this argument also ignores that the impact on investment and expenses of public policies, such as universal service requirements, carrier of last resort obligations, understated depreciation rate prescriptions. The impact of the costs of these public policies are not reflected in the proxy assumptions, but are real costs incurred by the incumbent LECs. Since the goal of any proxy should be to reflect actual costs, it is essential that the root cause of any variation between a proxy and independent evidence be determined, and that any appropriate adjustments be made.

Sixth, the Staff Analysis says that use of public data assists in the independent evaluation of a model. Ameritech agrees that public data is valuable, but believes that private data may be even more accurate. One of the problems of using public data is that it is often aggregated over all carriers at levels that do not reflect actual cost characteristics. To further complicate the issue, more accurate cost data for individual carriers and areas exists, but is in private hands and is often proprietary to the individual companies. If a model uses data that has the advantage of being available but is nevertheless inaccurate; the model's results are still wrong.